

WE CLAIM:

1. A process for producing ethanol from plant material, comprising:
reducing the plant material to produce material comprising starch;
5 the reduced plant material have particle size such that at least about 50% of
the particles fit through a sieve with a 0.1-0.5 mm mesh;
saccharifying the starch, without cooking, with an enzyme composition;
fermenting the incubated starch to yield a composition comprising at least 15 vol-%
ethanol;
10 fermenting comprising reducing temperature of fermenting mixture; and
recovering the ethanol and co-products from the fermentation
2. The process of claim 1, wherein plant material comprises corn, which comprises
high amylopectin starch.
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3. The process of claim 1, wherein the plant material comprises corn, sorghum,
millet, wheat, barley, rye, or mixtures thereof.
4. The process of claim 3, wherein the corn comprises waxy corn.
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5. The process of claim 3, wherein the corn comprises high protein corn.
6. The process of claim 3, wherein the corn comprises #2 yellow dent corn.
- 25 7. The process of claim 1, comprising reducing the plant material with hammer mill,
roller mill, or both hammer mill and roller mill.
8. The process of claim 7, comprising reducing the plant material to produce plant
material of a size that at least 35% of the reduced plant material fits through a 0.1-0.5 mm
30 screen.

9. The process of claim 1, comprising reducing the plant material with particle size reduction emulsion technology.
10. The process of claim 1, comprising simultaneous saccharifying and fermenting.
11. The process of claim 1, comprising decreasing temperature during saccharifying, fermenting, or simultaneous saccharifying and fermenting.
12. The process of claim 1, comprising saccharifying, fermenting, or simultaneous saccharifying and fermenting at temperature of 25-40 °C.
13. The process of claim 1, comprising saccharifying, fermenting, or simultaneous saccharifying and fermenting at temperature of 27-35 °C.
14. The process of claim 1, comprising reducing temperature from about 40 °C and to about 25 °C during saccharifying, fermenting, or simultaneous saccharifying and fermenting.
15. The process of claim 1, comprising saccharifying, fermenting, or simultaneous saccharifying and fermenting at pH of about 3.0 to about 6.0.
16. The process of claim 1, comprising saccharifying, fermenting, or simultaneous saccharifying and fermenting at pH of about 4.1 to about 5.3.
17. The process of claim 1, comprising a pH of about 4 to about 4.5 at start of fermentation fill.
18. The process of claim 1, comprising a pH of about 5 to about 5.5 as ethanol production reaches maximum level.
19. The process of claim 1, comprising increasing pH from about 4 to about 5.3 during saccharifying, fermenting, or simultaneous saccharifying and fermenting.

20. The process of claim 1, comprising decreasing solid content from about 40% to about 15% during saccharifying, fermenting, or simultaneous saccharifying and fermenting.
- 5 21. The process of claim 1, wherein the enzyme composition comprises alpha amylase, glucoamylase, protease, or mixtures thereof.
22. The process of claim 1, wherein saccharifying, fermenting, or simultaneous saccharifying and fermenting comprises adding protease.
- 10 23. The process of claim 1, wherein saccharifying, fermenting, or simultaneous saccharifying and fermenting comprises adding backset.
24. The process of claim 1, wherein saccharifying, fermenting, or simultaneous
- 15 saccharifying and fermenting comprising adding nitrogen.
25. The process of claim 1, comprising saccharifying and fermenting at rates that maintain concentration of glucose less than 3 wt-% in fermentation.
- 20 26. The process of claim 1, comprising saccharifying, fermenting, or both saccharifying and fermenting with about 0.1 to about 10 acid fungal amylase units (AFAU) per gram of dry solids reduced plant material and about 0.1 to about 6 glucoamylase units (AGU) per gram dry solids reduced plant material.
- 25 27. The process of claim 1, comprising starting saccharifying, fermenting, or both saccharifying and fermenting with about 25 to about 45 wt-% reduced plant material in water.
28. The process of claim 1, comprising starting saccharifying, fermenting, or both
- 30 saccharifying and fermenting with residual starch at up to 20%.

29. The process of claim 1, comprising producing greater than 18 vol-% ethanol in about 48 to 96 hours.
30. The process of claim 1, comprising producing 18 vol-% to about 23 vol-% ethanol.
31. The process of claim 1, further comprising recovering the solids from the fermentation.
32. The process of claim 31, recovering before, during, and after recovering the ethanol.
33. The process of claim 31, comprising recovering distiller's dried grain.
34. The process of claim 31, wherein the distiller's dried grain comprises about 30-38 wt-% protein, about 11-19 wt-% fat, about 25-37 wt-% fiber.
35. The process of claim 31, wherein the distiller's dried grain comprises at least about 30% protein.
36. The process of claim 1, comprising running the process as a batch process or as a continuous process.
37. A process of drying distillation products from the production of ethanol, comprising:
producing starch from corn and ethanol from the starch;
producing reduced stack emissions of 1.47 or less pounds of volatile organic compounds per ton of corn.
38. The process of 37, further producing reduced stack emissions of 0.98 or less pounds of carbon monoxide per ton of corn processed.

39. A process for producing ethanol from plant material, comprising:
reducing the plant material to produce material comprising starch;
saccharifying the starch, without cooking, with an enzyme composition
5 comprising acid fungal amylase;
fermenting the incubated starch to yield a composition comprising at least
about 18 vol-% ethanol;
recovering ethanol from the fermentation.
- 10 40. A distiller's dried grain comprising at least about 30 wt-% protein.
41. A distillers dried grain comprising about 30-38 wt-% protein, about 11-19 wt-
% fat, about 25-37 wt-% fiber.
- 15 42. A corn beer comprising at least about 18% ethanol.